

# Complex analysis

## Quick facts

No residential school

4 Tutor-marked assignments (TMAs)

Examination

## Course content

There is no real number whose square is  $-1$ , but mathematicians long ago invented a system of numbers, called complex numbers, in which the square root of  $-1$  does exist. These complex numbers can be thought of as points in a plane, in which the arithmetic of complex numbers can be pictured. When the ideas of calculus are applied to functions of a complex variable a powerful and elegant theory emerges, known as complex analysis.

The course shows how complex analysis can be used to:

- determine the sums of many infinite series
- evaluate many improper integrals
- find the zeros of polynomial functions
- give information about the distribution of large prime numbers
- model fluid flow past an aerofoil
- generate certain fractal sets whose classification leads to the Mandelbrot set.

The fourteen study texts make up four blocks of work, roughly equal in length:

*Introduction* Complex numbers – complex functions – continuity – differentiation

*Representation formulas* Integration – Cauchy's theorem – Taylor series – Laurent series

*Calculus of residues* Residues – zeros and extrema – analytic continuation

*Applications* Conformal mappings – fluid flows – the Mandelbrot set.

The texts have many worked examples, problems and

exercises (all with full solutions), and there is a course handbook that includes reference material, the main results and an index. These texts are supported by CDs that teach complex analysis techniques, while another CD presents a discussion of the central role of complex analysis in mathematics. A DVD uses computer graphics to demonstrate many geometric properties of complex functions.

## Entry

This is a Level 3 course. Level 3 courses build on study skills and subject knowledge acquired from studies at Levels 1 and 2. They are intended only for students who have recent experience of higher education in a related subject, preferably with the OU. You need proficiency in algebra, trigonometry and calculus, and the mathematical maturity gained from Level 2 mathematics courses. To undertake M337 you should have at least a grade 2 pass in M208 *Pure Mathematics* (or its predecessor, M203 *Introduction to pure mathematics*) or MST209 *Mathematical methods and models* (or its predecessor, MST207 *Mathematical methods, models and modelling*), or the equivalent. Students are more likely to complete this course successfully if they have acquired their prerequisite knowledge through passing one of these courses. If you have any doubt about the suitability of the course, please contact our Student Registration & Enquiry Service. Your regional centre will be able to tell you where you can see reference copies of the course units. A diagnostic quiz that will help you to determine whether you are adequately prepared for this course can be found on the website: [http://puremaths.open.ac.uk/m337quiz/M337\\_diagnostic.pdf](http://puremaths.open.ac.uk/m337quiz/M337_diagnostic.pdf)

## Preparatory work

There is no formal preparatory work, but you should revise your algebraic skills, and differential and integral calculus, before the course begins.

## Qualifications

This is a specified course in our:

- D44 Diploma in Statistics (2007 is the last year M337 can count towards the D44, although the D44 will continue with revised regulations)
- B14 BA (Hons) or BSc (Hons) Computing and Mathematical Sciences
- B31 BA (Hons) or BSc (Hons) Mathematics

- B36 BA (Hons) or BSc (Hons) Mathematics and Statistics
- B46 BA (Hons) Mathematics and its Learning

It can also count towards most of our other degrees at bachelors level, where it is equally appropriate to a BA or BSc. We advise you to refer to the relevant award descriptions for information on the circumstances in which the course can count towards these qualifications because from time to time the structure and requirements of a qualification may change.

### If you have a disability or additional requirements

The course should present no special difficulties, though it does include a lot of diagrams. Printed course material is available on audio cassette and there are transcripts of the course audio-visual material. If you are a new student, make sure that you have our booklet *Meeting your needs*. You can obtain a copy by contacting our Student Registration & Enquiry Service. We provide a range of support services for individual needs but some of these may take several months to arrange. Please contact us for advice if you have concerns about taking this course, or about the support that could be provided. The website [www.open.ac.uk/disability](http://www.open.ac.uk/disability) has the latest information about availability.

### Course materials

We use a mixture of media to help you learn. Our courses may include any of the following media that you will use from home (or wherever you choose to study): specially written texts, set books, online resources, audio CDs, audio and video cassettes, DVDs, CD-ROMs, computer software, a home experiment kit. For further information on set books go to <http://www3.open.ac.uk/about/setbooks/index.shtm>.

### Teaching and assessment

#### Support from your tutor

You will have a tutor who will mark and comment on your written work, and whom you can ask for advice and guidance. We may also be able to offer group tutorials or day schools that you are encouraged, but not obliged, to attend. Where your tutorials are held will depend on the distribution of students taking the course. Contact our Student Registration & Enquiry Service if you want to know more about study with the Open University before you register.

#### Assessment

There are four tutor-marked assignments (TMAs), submitted on paper, and an examination. Assessment is an essential part of the teaching, so you are expected to complete it all. But if you unavoidably miss or do badly in an assignment, some courses allow you a 'substitution score', calculated as a weighted average of all your scores for the course. In

M337 this rule can apply to one assignment only. You will be given more detailed information when you begin the course.

### Professional recognition

This course may help you to gain recognition from a professional body. Ask our Student Registration & Enquiry Service for *Recognition* leaflets 3.3 *Professional Engineering Institutions* and 3.6 *Institute of Mathematics and its Applications* or see the course description for **M337** at [www.open.ac.uk/courses](http://www.open.ac.uk/courses).

### More information

For full details, including course fees, start dates, services for disabled students, any computing requirements and information on how to become a student, visit the Course and Qualifications website [www.open.ac.uk/courses](http://www.open.ac.uk/courses).

We make every effort to ensure that this information is accurate but it could change if regulations or policies change or because of financial or other constraints.